The altitude of Mount Hamilton is certainly just over 4200 feet, probably between 4209 and 4224. For practically all purposes this is as close as is necessary for actual use, altho it would be interesting to know the exact height of the mountain.

WILLIAM G. REED.

BERKELEY, CAL., September 3, 1914.

## COLOR VARIATION OF THE CLUSTER-TYPE VARIABLE RS BOÖTIS.

The very sudden and rapid increase in the brightness of cluster-type variables after the gradual decline to minimum suggests, if it does not demand for its explanation, some disturbance in the stellar atmosphere. Such a disturbance would almost certainly be accompanied by changes in the color of the light radiated by the star.

The matter has been put to a test in the case of the variable RS *Boötis,* whose period is $9^h\ 3^m$ and whose visual amplitude of variation, as shown by unpublished Laws Observatory observations, is approximately one magnitude. To avoid the influence of possible fluctuations in the light-curve, ordinary and isochromatic plates (the latter used with a yellow filter) were alternately exposed on three successive nights — July 16, 17 and 18, 1914—the instrument used being the 60-inch reflector. The exposures were, respectively, one minute and two minutes on the two kinds of plates. Five or six were made on each ordinary plate, and three or four on the isochromatic plates. A total of 85 plates and about 350 separate exposures cover the entire curve, with sufficient overlap from night to night to test the possibility of systematic differences between the three series of observations.

Five comparison stars covering an interval of about 2.5 magnitudes are available for the reduction of the measures of the variable. Their magnitudes on an absolute scale were established by varying the aperture for the different exposures. The apertures used were 32, 14 and 9 inches for the ordinary plates, and 60, 40 and 32 inches for the isochromatic plates.

Both the photographic and the photovisual scales were separately derived from the data of two nights. The difference in the magnitudes of the comparison stars for the two nights are:

| Star . . . . . | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Photographic . . . . | +0.06 | −0.04 | −0.01 | −0.06 | 0.00 magnitude |
| Photovisual . . . . | −0.03 | +0.04 | −0.02 | +0.01 | −0.06 magnitude |

In each case the faintest star—No. 4 for the photographic scale and No. 5 for the photovisual—was disregarded in reducing the results for the different plates to a common zero point. This accounts for the fact that the sums of the differences do not in either case equal zero.

With the aid of the mean scales for the two nights, the entire series of observations on the variable was reduced to a uniform system. The results for each plate were combined to form a mean value, which, in spite of the rapid change in brightness, is justifiable since the interval covered is only six or eight minutes. There are thus available for the formation of the light-curves 83 points (two plates were rejected), 43 for the photographic light-curve and 40 for the photovisual.

It was found that the photographic range is nearly 50 per cent in excess of the photovisual. For the present the amplitudes may be taken as 1.5 and 1.1 magnitudes, respectively. The change in the color index is therefore about 0.4 magnitude, which corresponds to about one spectrum class. The limiting values of the color index cannot now be given, as the zero points of the magnitude scales are still to be determined. The probable values, however, can be assigned on the basis of the spectroscopic results by PEASE. He finds that the spectral type of the star is constantly changing, with limiting values of B8 and Fo, respectively, for maximum and minimum. The corresponding color indices on the scale of PARKHURST are −0.10 magnitude and +0.40 magnitude. The spectroscopic and photometric results, in so far as the amount of change in color is concerned, are therefore in close agreement.

The variable was observed during increasing light upon two successive nights. The computed interval separating corresponding epochs is therefore three periods or $27^h\ 10^m$. That actually observed is $27^h\ 12^m$, which illustrates the precision with which the instant of a given brightness on the ascending branch of the curve can be determined.

The epochs of photographic and photovisual maxima appear to coincide.

The period of $9^h\ 3^m\ 21^s.57$, assigned by PRACKA,[1] represents the observed maximum on July 17th exactly. Finally, it may be remarked that the photovisual amplitude is in good agreement with that found visually at the Laws Observatory.

F. H. SEARES and HARLOW SHAPLEY.

MT. WILSON SOLAR OBSERVATORY, August 18, 1914.

## THE STAR CLUSTER N. G. C. 6760.

The object N. G. C. 6760 has been suspected as variable, but DREYER in a note in the N. G. C. states that there is no reason for supposing this to be so.

BORRELLY'S note in *C. R.*, **157**, 385, leads one to suppose that the object is changing in brightness, and it was accordingly placed on the observing program of the 60-inch reflector.

Two photographs were obtained on Seed 27 plates, with exposures of ¾ and 1½ hours respectively. The 1½-hour photograph revealed a star cluster lying in a rich region of the Milky Way. A single count of this plate was made with a reseau having squares 30″ on a side and the results plotted. It proved to be a cluster of 1,200 stars, 7′ in diameter, lying on a background with a density of fifteen stars per square minute. The greatest number of stars counted in a single square of the reseau was 71, which would make 67 for the cluster. Mr. SEARES estimates that the stars in the cluster lie between 16.5 or 17 and 19.5 photographic magnitude.

No trace of nebulosity is found.

Under a power of 300, which was as much as the seeing would permit, the cluster appeared granular, but save for a few of the brighter stars was not certainly resolvable.

A comparison of the two plates under the stereocomparator gave no indication of variability.

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## SPECTRA OF STARS IN THE HERCULES CLUSTER M 13.

An additional photograph of Messier 13 was obtained with the focal plane spectrograph of the 60-inch reflector, using a slit width of $0.050^{mm}$ and an exposure of thirty hours.

[1] *V. J. S.*, 1913, p. 290.